

## CLAIMS

1. Tyre (3; 30) for vehicles, in particular for motor vehicles, which has an axis (13) of symmetry and comprises
  - 5 a tread (16), two sidewalls (15), and two beads (8) which are attached to a wheel rim (2) made of elastomer material, characterised in that it additionally comprises at least one tubular reinforcement body (18;35) for coaxial reinforcement on the said axis (13), which is surrounded by
  - 10 the said tread (16) and extends between the said sidewalls (15); each of the said sidewalls comprising a respective resilient annular membrane (24) with a straight generatrix which forms an angle (A) other than 90° with the axis (13) of the tyre (3).
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  2. Tyre according to claim 1, characterised in that the said tubular body (18;35) has a dimension measured parallel to the said axis (13) which is substantially the same as that of the tread (16) measured in the same direction.
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  3. Tyre according to claim 1 or 2, characterised in that the said tubular body (18;35) has lateral through-apertures (21).
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  4. Tyre according to claim 3, characterised in that at least some of the said through-apertures (21) are apertures which are elongate in the circumferential direction.
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  5. Tyre according to claim 3 or 4, characterised in that at least some of the said apertures (21) are aligned with one another circumferentially in order to form a circumferential row of apertures.

6. Tyre according to claim 5, characterised in that the said tubular body (18;35) comprises at least one pair of the said circumferential rows of apertures which are spaced from one another in the axial direction.

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7. Tyre according to any one of the preceding claims, characterised in that the said tubular body (18;35) is delimited by respective cylindrical surfaces which are coaxial to the axis (13); at least one of the said 10 cylindrical surfaces has a generatrix line which is straight and parallel to the axis (13) of the tyre (3).

8. Tyre according to one of claims 1 to 6, characterised in that the said tubular body (18) is a corrugated body.

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9. Tyre according to claim 8, characterised in that the said tubular body has at least one circumferential rib (19).

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10. Tyre according to any one of the preceding claims, characterised in that the said tubular body (18) is made of harmonic steel.

11. Tyre according to any one of claims 1 to 9,

25 characterised in that the said tubular body (18;35) is made of plastics material.

12. Tyre according to any one of the preceding claims,

characterised in that the tubular body (18;35) is at least

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partially embedded in the said tread (16).

13. Tyre according to any one of the preceding claims, characterised in that the said membranes (24) are made of anisotropic material.

5 14. Tyre according to claim 13, characterised in that the said membranes (24) are reinforced with fibres which are disposed and oriented such as to prevent localised deformations of the membranes in a loaded condition.

10 15. Tyre according to claim 14, characterised in that the said membranes (24) are reinforced such as to contain the tension forces which are present on the membranes (24) themselves in static load conditions above a dihedron (26) which is tangent to the beads (8) and has a vertex parallel 15 to the axis (13).

16. Tyre according to any one of the preceding claims, characterised in that the generatrices of the said membranes (24) converge towards one another in order to 20 meet at a point outside the tread (16).

17. Tyre according to any one of claims 1 to 15, characterised in that the generatrices of the said membranes (24) converge towards one another in order to 25 meet at a point inside the tyre (3).

18. Tyre according to any one of the preceding claims, characterised in that the said membranes (24) have cross-sections which are substantially constant in a radial 30 direction.

19. Tyre according to claim 18, characterised in that the said cross-sections are substantially rectangular cross-sections.

5 20. Tyre according to any one of the preceding claims, characterised in that the said beads (8) comprise at least one annular projection (9) which can engage with a corresponding retention seat (7) when it is fitted onto the wheel rim (2).

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21. Tyre according to any one of the preceding claims, characterised in that the said tread (16) comprises a plurality of apertures (20) for communication with the interior of the tyre; the said apertures (20) being 15 provided to correspond with an equivalent number of apertures (21) provided through the said tubular body (18;35).

22. Tyre according to claim 21, characterised in that the 20 said apertures are closed by means of materials which are permeable to water, and can prevent the intake of foreign bodies into the tyre.

23. Tyre according to claim 22, characterised in that the 25 said materials which are permeable to water are porous materials.

24. Tyre according to any one of the preceding claims, characterised in that the said tread (16) is vulcanised 30 onto an outer surface of the said tubular body (18;35).

25. Tyre according to any one of the preceding claims, characterised in that the said tread (16) comprises a

plurality of outer circumferential grooves (22), and in that the said grooves communicate with the interior of the tyre via a plurality of through-radial passages (20,21).

5 26. Tyre according to any one of the preceding claims, characterised in that the said membranes (24) are stretched radially between the said tread and the said beads (8) such as to be pre-tensioned in the absence of loads on the tyre.

10 27. Tyre according to any one of claims 1 to 12, characterised in that the said membranes (24) are made of homogeneous elastomer material.

15 28. Tyre according to claim 27, characterised in that the said homogeneous material is an isotropic material.

29. Tyre according to claim 27 or 28, characterised in that the said membranes (24) are made of polybutadiene rubbers.

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30. Tyre according to claim 27 or 28, characterised in that the said membranes (24) are made of polyisoprene rubbers.

25 31. Tyre according to claim 27 or 28, characterised in that the material of which the said membranes (24) are made comprises polycondensate of dimethylsilanol, wherein the methyl units are substituted by vinyl or phenolic units.

30 32. Tyre according to any one of claims 1 to 6, characterised in that the said tubular reinforcement body (35) comprises an annular belt (36) and a plurality of blocks (37) which are supported by the said annular belt in

positions adjacent to one another, and can be forced against one another in order to apply resistance to the circumferential actions of compression present on the tyre during the rotation of the tyre itself.

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33. Tyre according to claim 32, characterised in that the said blocks (37) project from the said annular belt (36) towards the interior of the tyre.

10 34. Tyre according to claim 32 or 33, characterised in that the said annular belt (36) comprises a plurality of reinforcement threads or strips (39).

15 35. Tyre according to claim 34, characterised in that the said annular belt (36) comprises a portion (38) of elastomer material in which the said reinforcement threads or strips (39) are embedded.

20 36. Tyre according to claim 34 or 35, characterised in that the said annular belt (36) is connected integrally to the said tread (16).

25 37. Tyre according to claim 34 or 35, characterised in that the said tread is connected to the said annular belt (36) in a manner such that it can be released, so that it can be replaced when it reaches a wear limit.

30 38. Tyre according to any one of claims 35 to 37, characterised in that the said annular belt (36) is glued to the said tread (16).

39. Tyre according to any one of claims 32 to 38, characterised in that the said blocks (37) are tapered towards the interior of the tyre.

5 40. Tyre according to claim 39, characterised in that the said blocks (39) delimit between one another notches (47) which extend in a direction substantially parallel to the said axis (13).

10 41. Tyre according to claim 39, characterised in that the said blocks (37) are distributed in order to form a plurality of axial rows (41) parallel to the said axis (13) and a plurality of circumferential rows (42).

15 42. Tyre according to any one of claims 39 to 41, characterised in that the said blocks (37) are connected to one another by relative mobility means (43;53) which can permit displacement of the blocks (37) relative to one another during the rotation of the tyre (3).

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43. Tyre according to claim 42, characterised in that the said relative mobility means are virtual hinges (44; 53,54).

25 44. Tyre according to claim 43, characterised in that the said blocks (37) are connected to one another by connection portions (43) which define the said relative mobility means; the said blocks (37) and the said connection portions constituting part of a body (45) made in a single  
30 piece.

45. Tyre according to claim 44, characterised in that it additionally comprises means for reaction (52a) which,

during the rotation of the tyre, can apply action which opposes that which generates the relative displacement of the said blocks (37).

5 46. Tyre according to claim 45, characterised in that the said means for reaction are interposed between the belt (36) and the blocks (37).

47. Tyre according to any one of claims 32 to 46,  
10 characterised in that the said blocks (37) are solid bodies.

48. Tyre according to any one of claims 32 to 46,  
characterised in that the said blocks (37) are hollow  
15 bodies.

49. Tyre according to claim 48, characterised in that the said tubular reinforcement body (35) has an alveolar structure.

20 50. Tyre according to any one of claims 45 to 47  
characterised in that the said blocks (37) are connected integrally to the said belt (36) by being glued or vulcanised.

25 51. Wheel rim (2) for vehicles, comprising an inner portion (5), two radial annular portions (6) which project from the said inner portion (5) and support respective seats (7) for accommodation of corresponding beads (8), and  
30 a tyre (3) produced according to claim 1, and a wall (12) which extends between the said annular portions (6) coaxially to an axis (13) of the wheel rim (2), and in use faces the said tyre (3), characterised in that the said

wall (12) comprises a plurality of through-apertures (21) which are permanently open.

52. Wheel rim according to claim 51, characterised in that  
5 it comprises an annular portion (31) which is coaxial to the said axis (13) and is made of elastomer material; the said annular portion (31) defining a radial support stop for the said tread (16).